to a cluster of individual stones which froze together while falling or after reaching the ground.

India seems to be a land of frequent occurrence of hail of unusual size. Eliot, in a study of Indian hailstorms, tabulated measurements of the hailstones of 600 storms, and found that in 27 per cent of the measurements the stones were smaller than peas; in 51 per cent they were larger than peas, but smaller than a lemon; in 22 per cent they were larger than a lemon. Another investigator, Bruist, found the *mean maximum circumference* of Indian hailstones to be from 4 to 6 inches, with a weight varying from 2.2 to 4.4 ounces. The largest were 10 to 13 inches in circumference, weighing from 0.62 to 1.24 pounds.

In the light of recent knowledge of the temperature conditions existing in the upper atmosphere and of the general weather conditions which accompany severe local disturbances, such as tornadoes, thunderstorms, and hailstorms, it is not a difficult matter to account for the production of hail during the warm months of the year. But the manner in which masses of ice are sustained in the atmosphere long enough to acquire a weight of many ounces is still something of a mystery. However, we

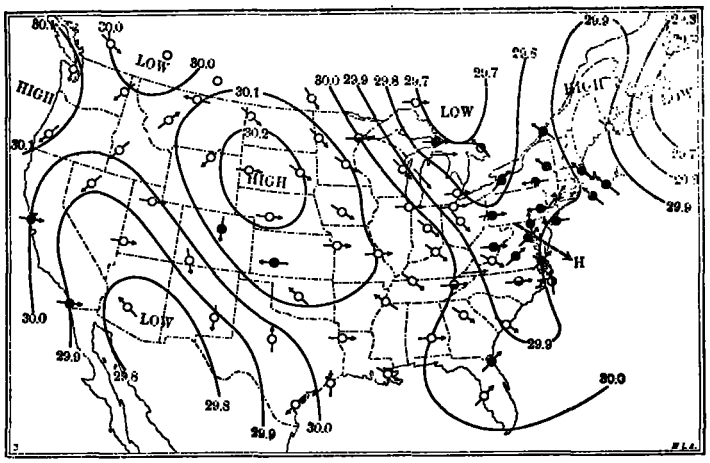

FIG. 3.—General weather conditions at 8 a. m., June 22, 1915. The hailstorm occurred six hours later along the dotted line, *H*, across Maryland.

know that hailstorms exhibit evidences of rapid and powerful rising currents within the central cloud masses; that there is generally an incessant play of lightning between the clouds, and that these clouds are built up to great heights, retaining the liquid character of their particles in a subcooled condition with temperatures far below freezing. Volta long ago accounted for the onion-like structure of hailstones by assuming that the hail nucleus, once formed, is kept in a state of oscillation between oppositely electrified clouds until the constant accretion of layers of ice so increases the weight that the hailstone can be no longer sustained by the movements of the atmosphere, and falls to the ground. Variations in the electrical potential of cloud particles are known to cause the particles to coalesce. Ferrel suggested that the strong ascensional currents within a hailstorm carried the hailstones to great heights, receiving constant accretions on their way, and that it is probable that the hail, falling out of the strong ascensional currents or being thrown out, may be repeatedly carried up to altitudes where the temperature is below freezing and thus grow to great size before falling to the ground.

General weather conditions.—The 8 a. m. weather map of June 22, 1915, showed a general condition very favorable for the formation of severe local storms. (See fig. 3). A well-developed and extensive area of high pressure was moving rapidly eastward across the Central States. There was a narrow ridge of relatively high pressure over the New England States and extending southward over the Atlantic Ocean. The Lower Lake Region, the Middle and the South Atlantic States, were in a trough of low pressure, with a sharply defined "squall line" separating the southerly and easterly winds and overcast skies from the strong westerly winds and clear skies. The V-shaped depression was moving from southwest to northeast across the Middle Atlantic States; the local thunderstorms and hailstorms which formed along the advancing front of the area of high pressure, or along the squall line, moved southeastward across Maryland and Delaware at the rate of approximately 50 miles per hour.

At Baltimore the barometer fell steadily from midnight of June 21 to nearly 5 p. m. of the 22d, when it rose abruptly 0.05 inch. This jump was accompanied by a change in the direction of the wind from southerly to northerly, marking the passing of the "squall line." Earlier on the 22d, between 1:30 p. m. and 2 p. m., a thunderstorm was observed west of the city moving from northwest to southeast. Undoubtedly this was the storm which produced the heavy fall of hail at intervals along the path from Carroll County to the Atlantic Ocean.

INFLUENCE OF A FOREST ON THE TEMPERATURE OF AN AIR CURRENT.[1]

L'abbé MICHEL LALIN.

[Dated: Vievigne (Côte-d'Or), Mar. 26, 1913.]

* * * My observations are here confined to the single problem of what influence a wooded region may exert on the temperature of a current of air.

The forest of Four (Bois du Four) between Spoy and Vievigne in the Côte-d'Or has a width of about 800 meters. Two thermometers, graduated to one-tenth degree [centigrade] were set up on the eastern and western margins at a distance of about 30 meters from the wood. At each observation their readings were checked against the reading of a whirled thermometer.

Between May 15 and September 30 I made 70 observations at various hours but most often in the forenoon. The results are as follows:

EAST wind, 17 times: On the E. margin the thermometer always showed readings 0.3° to 0.8°C. *higher* than those on the W. margin.

WEST wind, 26 times: The thermometer on the E. or downstream from the wood showed readings 0.3° to 0.75°C. lower than those on the W. margin.

RAIN, 8 times: Wind was W. or SW., but the temperature was the same on either margin of the wood.[2]

CALMS or the wind did not blow across the wood from one station to the other, 19 times: The thermometers were in accord.

I conclude that the current of air has cooled in passing through this thin tree-curtain.

On examining the figures it seems to me that one is led to conclude that this modification in temperature is quite independent of the initial temperature of the air and depends solely on the velocity of the wind. The lighter the wind, the greater is the difference. The maximum difference of 0.8°C. corresponded with a wind of velocity 3 on

[1] Assoc. Franc. pour l'Av. des. sci., Compte rendu de la 42me sess. Tunis, 1913: Notes et Mémoires. Paris. 1914. pp. 242-243.

[2] This is readily explained as the result of the lower calorific capacity of water.—*Author.*

the [French] telegraphic scale [i. e., 4 to 6 m/sec., or about 12 miles an hour].

Mixture with layers of warmer air upon emerging from the wood, rapidly decreases this difference.

It may be asked here, whether this fall in temperature has any influence on atmospheric precipitation. On August 2, with a wind WSW., the west side of the wood was quite immune, but the whole east side was watered by a fine rain that extended almost 2 kilometers out from the eastern margin. At Vievigne, about 1 kilometer distant, the raingage collected 1.4 millimeters of rain. I must admit that this is the only observation that was checked up, although the rainy summer [of 1913] did not lack in other opportunities. However, on several occasions when noticing the road that traverses this little grove from east to west, I have observed that all that portion stretching in front of the wood (east) was moistened, while behind the wood (west) there was no trace of rain.

COMMENT.

The above note by M. Lalin formulates an interesting problem to the forester-meteorologist. The effort to solve the problem experimentally may have been as successful as is stated; but the author does not tell us anything about a most important detail, viz, the conditions under which he exposed his thermometers. As is well known, and was recently emphasized again (this REVIEW, August, 1915, pp. 389–390), the usual French screen does not permit us to compare temperatures within such narrow limits as 0.3 or 0.5 degree centigrade difference in readings. The American meteorologist will therefore reserve judgment on both the temperature influence and the rainfall believed to have been produced by this restricted wood.—C. A., jr.

ORGANIZATION OF THE METEOROLOGICAL OFFICE IN LONDON.[1]

By W. N. SHAW, Director.

[Dated: London, S. W., Dec. 22, 1914.]

His excellency asked to be informed of the "*textes législatifs et administratifs* qui réglementent les services de météorologie générale et plus particulièrement de météorologie agricole en Grande Bretagne."

Textes législatifs.—The only legislative authority for the meteorological services of this country in any year is the appropriation by Parliament of a sum as a "Grant-in-Aid" for the "Meteorological Office" in the appropriation act of that year.

A "Grant-in-aid" is a fixed sum handed over by His Majesty's Treasury to be administered under conditions laid down by the Treasury, by some body of persons, whether constituted expressly for that purpose or not, who become responsible for the expenditure and for any administrative action taken in conformity with the prescribed conditions.

The Ministers responsible to Parliament for the grant, the Lords of the Treasury, accept no responsibility for the actions of the administrative body provided they are within the prescribed conditions.

The grant for the expenses of the Meteorological Office was fixed at £20,000 [$97,330] in the year 1913. It is included in the Votes for Scientific Investigations, and is made to the Meteorological Committee, a body constituted by a Minute of the Treasury.

By custom, the committee which administers a grant-in-aid is allowed to undertake the administration of other grants, and also to receive payment for special duties undertaken for, or in certain cases, to departments of Government. It is not entitled to the official services of the Post Office or other departments of state, but by special arrangement the Meteorological Office enjoys certain official facilities with regard to the priority of meteorological telegrams and with regard to stationery and printing.

The total expenditure on the various services in the administration of the Meteorological Committee is about £30,000 [$145,995] a year. It must, however, be pointed out that the meteorological observations available at the office include those which are carried on by municipal corporations and by private persons primarily for their own purposes and at their own expense. The office acts only as adviser, organizer, compiler, and publisher of results in these cases. This voluntary work—taking observations of rainfall also into account—probably represents an expenditure of £20,000 [$97,330], making the whole expenditure on meteorological services in [Great Britain and Ireland], including municipal and private enterprise, about £50,000 [$243,325], of which £21,000 [$102,196] is provided by Government.

Textes administratifs.—The only *textes administratifs* for the meteorological services are the Minute of the Lords Commissioners of His Majesty's Treasury, dated 20th May, 1905, constituting a Director of the Meteorological Office and a Meteorological Committee with the Director as chairman, and subsequent Treasury Minutes reconstituting the committee or appointing members thereof.
* * *

In accordance with regulation, accounts of the receipts and expenditure of the office for each year are audited by the Comptroller and Auditor General and reported to Parliament. A report upon the work of the office is presented each year to the Treasury and laid before Parliament by command of His Majesty.

Any member of Parliament is therefore at liberty to raise any question upon the accounts or the report, but otherwise, with the limitations herein indicated, the director and committee have full discretion as to the objects to which the funds shall be devoted and the means which shall be adopted for securing them.

The practice of the Office is guided by tradition which has been formed in the past 60 years. The grant-in-aid has been increased from time to time for reasons urged either by the controlling authority or by parliamentary critics of the Office. Each increase has carried with it the intention to accomplish some specific object, and therefore, a tacit obligation on the part of the controlling authority; but the Treasury has never made conditions about details of expenditure and has always accepted the statement of the proposed allocation of the grant without comment, so that the Committee is not bound by any conditions but merely guided by its own judgment in accordance with tradition and practice.

It is important to note this in consideration of the special application of meteorology to agriculture. That is one of the objects of the Office, but any other of the applications of meteorology in the interest of the public is equally so. There is no special allocation of funds for the application of meteorology to agriculture as such.

[1] *Reprinted from* Tenth Annual Report of the Meteorological Committee * * * for the year ended 31 March, 1915 (the 60th year of the Meteorological Office). London. 1915, pp. 65–74.
This memorandum was "drawn up * * * at the request of the Foreign Office, dated 2d February, 1914, for the use of the French Ambassador [to Great Britain]".